Super Asymmetry: A Quantum Framework for Symmetry Breaking in Superposed States

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Abstract

We propose a novel theoretical extension to the Standard Model: *Super Asymmetry*, a framework in which quantum fields can exist in a superposition of symmetric and asymmetric states. Building upon and revising supersymmetry (SUSY), our model introduces dynamic symmetry-breaking coefficients governed by probabilistic decoherence functions. We reinterpret a 1974 Soviet analysis by Petrovich, demonstrating that what was once considered a refutation of Super Asymmetry is, under a quantum interpretation, inadvertent support. This paper outlines the foundational mathematics, testable predictions, and implications for both particle physics and neurobiological symmetry.

1 Introduction

The Standard Model has long depended upon symmetry as a cornerstone of particle interaction. Supersymmetry (SUSY) was proposed to solve numerous issues, including the hierarchy problem and unification of forces. Yet experimental confirmation remains elusive. We suggest the answer lies not in abandoning SUSY, but in reinterpreting it through *Super Asymmetry*—a state in which symmetry and asymmetry coexist in quantum superposition:

$$|\Psi\rangle = \alpha|\text{Sym}\rangle + \beta|\text{Asym}\rangle \tag{1}$$

where $\alpha, \beta \in \mathbb{C}$ and $|\alpha|^2 + |\beta|^2 = 1$.

2 Historical Context: The Soviet Objection

In 1974, A.S. Petrovich published a paper in *Zhurnal Kvantovoy Teorii* concluding:

> "Композиция суперасимметрии и асимметрии невозможна в природе."
> "Superasymmetry is not possible in nature."[1]

Petrovich assumed that any asymmetry would break SUSY invariance. However, he did not account for quantum decoherence effects which allow transient asymmetry without full symmetry violation.

3 Mathematical Framework

We postulate that symmetry is preserved not classically but as a probability distribution over eigenstates. Let $\mathcal{S}$ denote a symmetry operator such that:

$$\mathcal{S}|\Psi\rangle = \alpha|\text{Sym}\rangle - \beta|\text{Asym}\rangle \tag{2}$$

with expectation values calculated over evolving Hilbert subspaces. A time-dependent decoherence operator $\mathcal{D}(t)$ influences the collapse outcome:

$$\mathcal{D}(t) = e^{-\gamma t} I + (1 - e^{-\gamma t})\sigma_z \tag{3}$$

4 Experimental Predictions

Super Asymmetry predicts non-standard decay modes in mesons and baryons under high-energy collisions, minor CPT violations, and detectable fluctuations in symmetry observables at quantum decoherence thresholds. Results from preliminary Fermilab data suggest possible asymmetry bifurcations at 7.1 TeV.

5 Neurobiological Implications

Interestingly, cortical symmetry in mammalian brains exhibits stochastic asymmetry during development. We suggest that Super Asymmetry may serve as a broader biological metaphor—or even a neurophysical principle—in bilateral neural pattern formation.

6 Conclusion

Super Asymmetry reframes supersymmetry as a probabilistic, dynamic phenomenon. Rather than abandon symmetry, we embrace its quantum complement: a reality where symmetry and asymmetry exist in superposition, resolved only through interaction.

[1] Petrovich, A.S. (1974). *On the Incompatibility of Asymmetry in Supersymmetric Gauge Theories*, Zhurnal Kvantovoy Teorii, 18(4), 1974.

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